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Abstract

The government of the United Arab Emirates (UAE) is sharing the oil wealth with the local population through various generous subsidies. Most nationals work for the government and compared to the private sector their salaries are far better, they have better working hours and more vacation days. A large pool of low wage migrant workers is active within the country. These two combined lead to unemployment of locals as they cannot compete in the private sector with the low wage migrant workers. Unemployment in 2008 amounts to 38,186 Emiratis, out of the Emirati labor force of 468,215. There is no unemployment of non-nationals as they leave the country if they are out of a job and cannot find another job. We conduct a possible cost-neutral policy experiment aimed at increasing the low levels of employment of nationals. Part of the non-work related benefits to the local population are shifted to work-related benefits. The general subsidy to nationals is reduced by 1.0% and this allows for a wage subsidy of 0.9%. The effects of this experiment are analyzed using a multi-sector forward-looking dynamic computable general equilibrium (CGE) model and lead to an immediate drop of unemployment by 4.26%. Over time unemployment settles at a value that is 4.37% lower than its base run value. This is the first attemp to create an forward-looking multisector model for the Gulf region.

Keywords: Dynamic CGE, unemployment, wage subsidy.

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1 Introduction

The structure of UAE economy is quite different from a Western economy. The UAE economy is oil dependent and the government has been trying hard to lessen this dependency; they are rather successful in this respect. Another striking feature of UAE economy is the dependency on immigrant labour. Around 80% of UAE population consists of immigrants. Labour costs are low and the share of labour income as a percentage of value added is around 25%. Consequently, the reward for investment is relatively high.

Even though the UAE economy is booming, there are still Emiratis[1], the indigenous population, that are unemployed. To some extent the UAEs economic success is partly as a result of employing low wage workers from outside the UAE who are often experienced and have the right education for the job that they have within the UAE. UAE nationals have a disadvantage in that when they enter the labor market after finishing school, their level of experience is low. But they cannot and do not want to compete with the cheaper foreign labor. In this paper a policy experiment is carried out aimed at tackling this competitive disadvantage that nationals face in the labor market compared to low wage non-nationals. The policy experiment deals with the supply side of the labor market. This experiment is also cost neutral in that we redistribute some of the subsidy given to nationals in terms of housing, education, health care and electricity and water and replace this subsidy by a wage subsidy. In effect, the wage subsidy is paid for by redistributing money associated with non-work related benefits to work-related benefits. In other words, it assumes that nationals receive a money benefit from the government from being employed. Policies like this have been tried in a range of different countries under different conditions and have proved reasonably successful. The salary of nationals employed in the private or government sector is supplemented by the government in the form of an employment linked subsidy. Nationals without a job do not receive this wage subsidy. As nationals make a choice of either working for pay or enjoying leisure or working at home, such a policy measure will induce nationals to increase their interest in paid employment. In this policy experiment, the introduction of the wage subsidy is fully financed by reducing the subsidy nationals get irrespective of whether they have a job or not.

The policy experiment uses a dynamic computable general equilibrium (CGE) model to trace out the economy wide consequences of this specific government policy aimed at reducing the unemployment of Emiratis, the first developed for the UAE. To simplify matters we have assumed that only nationals (Emiratis) own the capital stock that is available within the UAE. The net foreign assets owned

[1]In this paper we refer to the indigenous population of the UAE as Emiratis, locals or nationals. These terms are all equivalent. Guest workers, or expatriate workers in the UAE are referred to as expats or non-nationals.

by inhabitants of the UAE are assumed to be owned solely by Emiratis. These assumptions are rather strong, but for our first attempt to study unemployment of nationals in a model setting these assumptions simplify matters considerably. Another reason why we have to make these assumptions is that detailed economic data is lacking within the UAE. The data that is available is also questionable. By law there is the requirement that for all companies that are operated within the UAE, at least 51% of ownership must be in the hands of one or more nationals. (This law is not applicable to the free-zones within the UAE, because there it is possible for 100% ownership of a company to be in foreign hands). On the assumption that the law is enforced, at least 51% of profits should go to UAE nationals. This makes our assumption that all profits go to national less extreme. The largest part of the workforce within the UAE consists of low wage laborers mainly from Asia. It is assumed that they consume and the wage income that they do not consume is remitted to their home country. Another simplifying assumption is that the pattern of consumption for nationals and non-nationals is such that they consume goods from all the sectors in the same proportions. As we lack detailed data on this matter we make this assumption. There is no reason to believe that nationals and non-nationals have very different consumption bundles. The government has a number of instruments at its disposal to influence the choice Emiratis make whereby they divide their available time between paid work and other activities (such as leisure and home production). Another assumption made is that unemployment of nationals is voluntarily. Because of the generous subsidies provided by the government the wage required for nationals to take up employment is rather large and this makes them unlikely to be competitive with low wage non-nationals.

There has been one previous attempt at CGE modeling in the UAE, namely the static model developed by Hassanain (2002). By contrast we have developed a dynamic CGE model which enables us to provide some scenarios for the future. In the literature on CGE modeling dynamic models or recursive dynamic models have become more popular in the policy experimentation process. See for instance Andersen and Faris (2002) with a model for Bolivia. A model for Brazil has been developed by Bugarin et al. (2003). The present model is not a recursive model, but a model where consumers are maximizing utility and producers are maximizing net income. The model is more appropriate as it explicitly models dynamic efficient decisions made by consumers and producers. For similar models, see Diao, Yeldan and Roe (1998) for the Turkey's economy, Annabi and Rajhi (2001) for the economy of Tunisia, and Mabugu (2003) for the South African economy. The model developed in this paper is based on Devarajan and Go (1998), Vellinga (2008) and Diao, Yeldan and Roe (1998). The model of Devarajan and Go has also been applied to Bangladesh, Jordan and Poland; see respectively Piazolo (1999), Feraboli (2003) and Raihan (2004).

Other have also analyzed the UAE economy in depth, see for instance Elhiraika and Hamed (2002) who look at economic growth in a growth accounting framework. Sadik (2001) and Shihab (2001) provide

detailed economic statistics about the UAE economy. The present paper focuses in the first part on providing a complete picture of the UAE economy. This is done by assembling a social accounting matrix (SAM) of UAE for the year 2008. Various economic agents are considered and the channels through which they interact can be read off from the SAM.

Section 2 presents the description of UAE dynamic CGE model. Section 3 discusses the calibration and the SAM on which the calibration is based, together with the base run solution of the model. In Section 4 a policy experiment is carried out in which the subsidy to nationals is partly replaced by a wage subsidy. Finally, Section 5 concludes the paper and identifies the agenda for future research.

2 Model Description

The model we are setting up for UAE is a dynamic CGE model. The economy is assumed to consist of four types of agents and they are: a representative household as consumer, a representative firm, the government and the rest of the world. Each of them will be discussed separately. All accounting rules are discussed together with the terminal conditions to guarantee that the economy is in a steady state in the final time period.

2.1 Divide Output over Domestic Market and Exports

In each of the sectors (denoted by i) are domestic firms supplying goods to the domestic market (D_{it}) and to foreign countries (exports denoted by E_{it}) at each instant of time t. It is assumed that this division is governed by a constant elasticity of transformation (CET) production function (where $\rho_{e_i} > 1$, $\alpha_{e_i} > 0$ and $0 < \delta_{e_i} < 1$):

$$X_{it} = \alpha_{e_i} \cdot [\delta_{e_i} \cdot E_{it}^{\rho_{e_i}} + (1 - \delta_{e_i}) \cdot D_{it}^{\rho_{e_i}}]^{\frac{1}{\rho_{e_i}}} \tag{1}$$

The firms maximize revenues from the domestic and foreign market. The CET construction does justice to the fact that the total supply of goods and services within the UAE economy (X_{it}), whether domestically produced or imported, is divided between domestic use and the export. The term export refers here to both exports and re-exports because they constitute a composite good. We can determine the optimal ratio of export good and domestically supplied output good as a function of the prices of these goods (respectively PE_{it} and PD_{it}):

$$\frac{E_{it}}{D_{it}} = [\frac{PE_{it}}{PD_{it}} \cdot \frac{1 - \delta_{e_i}}{\delta_{e_i}}]^{\frac{1}{\rho_{e_i}} - 1} \tag{2}$$

We also have the zero profit condition (where is the price of the total supply of goods and services is PX_{it}):

$$PE_{it} \cdot E_{it} + PD_{it} \cdot D_{it} = PX_{it} \cdot X_{it} \tag{3}$$

The price of the export good, for all sectors, is the world price of the export good of that sector (PWE_it in US Dollars, so we have to multiply this by the exchange rate er) minus the export tax levied on that good (the export tax rate is te_i):

$$PE_{it} = PWE_{it} \cdot er_t \cdot (1 - te_i) \tag{4}$$

2.2 Production of Domestic Composite Good

For each sector there are firms that combine the good imported by that sector (M_{it}) with the domestically produced output good into a composite good that will be provided to the domestic market (C_{it}). The firms minimize the costs of combining the imported goods and the domestic product using a constant elasticity of substitution (CES) production function:

$$C_{it} = \alpha_{c_i} \cdot [\delta_{c_i} \cdot M_{it}^{-\rho_{c_i}} + (1 - \delta_{c_i}) \cdot D_{it}^{-\rho_{c_i}}]^{-\frac{1}{\rho_{c_i}}} \tag{5}$$

The composite good construction through the CES function reflects an important feature of the UAE economy which is the re-exporting of the imports, with or without adaptation. We make use of the Armington assumption whereby goods of the same type, but with different countries of origin, are treated as imperfect substitutes. Each country produces a unique set of goods, which, to a varying degree, are substitutes for, but not identical to goods produced in other countries. The CES function is used to capture the Armington assumption ($\rho_{c_i} > -1$, $\alpha_{c_i} > 0$ and $0 < \delta_{c_i} < 1$). We can determine the optimal ratio of import good and domestically supplied output good as a function of the prices of these goods (PM_{it} is the price of the imported good by sector i):

$$\frac{M_{it}}{D_{it}} = [\frac{PD_{it}}{PM_{it}} \cdot \frac{\delta_{c_i}}{(1 - \delta_{c_i})}]^{\frac{1}{1+\rho_{c_i}}} \tag{6}$$

The zero profit condition is now:

$$PM_{it} \cdot M_{it} + PD_{it} \cdot D_{it} = P_{it} \cdot C_{it} \tag{7}$$

The price of the import good is the world price of the import good (PWM_{it} in US Dollars so we have to multiply by the exchange rate) plus the import tariff (the import tariff rate is tm_i). This is true for the goods of all sectors:

$$PM_{it} = PWM_{it} \cdot er_t \cdot (1 + tm_i) \tag{8}$$

2.3 Price for Domestic Spender Type

The price of good i used for private and government consumption and for investment (PC_{it} is dependent on the price of output good in sector i (P_{it}) and the indirect tax rate (tx_i) according to:

$$PC_{it} = P_{it} \cdot (1 + tx_i) \tag{9}$$

2.4 Description of the Government

Government behavior is assumed exogenous in the model. So government consumption (G_{it} priced at PC_{it}) and government transfers ($GTRS_t$) are taken as given. We are then only left with the government budget constraint. Taxes collected (TAX_t) are used to finance government transfers, government consumption, subsidies to the Emiratis of the UAE ($SUBS$), a wage subsidy ($wsubs_t$, which is equal to the wage rate for Emiratis wl_t^{em}, plus a certain percentage) and government savings (SAV_t^{Gov}):

$$\begin{aligned} TAX_t &= GTRS_t \cdot PINDEX_t + \sum_{i=1}^{n} PC_{it} \cdot G_{it} + SUBS \cdot PINDEX_t + \\ &\quad wsubs_t \cdot LD_t^{em} + SAV_t^{Gov} \end{aligned} \tag{10}$$

Where the n denoted the number of sectors ($n = 8$ in our case) and the price index is given by:

$$PINDEX_t = \sum_{i=1}^{n} weight_i \cdot PC_{it} \tag{11}$$

The expression $PINDEX_t$ stands for the price index of a so-called composite consumption good at time period t (CD_{it}^{nat}), where the index nat stands for the nationality of the inhabitants of the UAE. We have nationals or Emiratis (em) and non-nationals (nn). The (exogenous) weight is defined as follows:

$$weight_i = \frac{\sum_{nat} CD_{it}^{nat}}{\sum_{i=1}^{n} PC_{it} \cdot \sum_{nat} CD_{it}^{nat}}$$

Here PC_{it} denotes the price of the composite consumption good and all the variables in this expression are base run values. It is assumed that of the inhabitants of the UAE, only UAE nationals receive the two types of subsidies from the government. Additionally, we assume that there are only government transfers to UAE nationals and therefore no transfers from the government of the UAE to non-nationals. Total taxes comprise of import tariffs, export taxes, taxes on companies (with tax rate it_i and these taxes are negative, so in effect a subsidy), income tax for nationals (TY_t), and indirect taxes on consumption goods, government consumption goods and investment goods (at rate tx_i):

$$\begin{aligned} TAX_t &= \sum_{i=1}^{n} tm_i \cdot PWM_{it} \cdot er_t \cdot M_{it} + te_i \cdot PWE_{it} \cdot er_t \cdot E_{it} + it_i \cdot PX_{it} \cdot X_{it} + \\ &\quad \sum_{i=1}^{n} tx_i \cdot P_{it}(\sum_{nat} \cdot CD_{it}^{nat} + G_{it} + INVD_{it}) + TY_t \end{aligned} \tag{12}$$

We also have the price of output good in the sector i (P_{it}) and the level of investment good sector i ($INVD_{it}$). Savings by households (SAV_t^{HH}) are exempted from income tax, as is the interest received on their net foreign assets (world interest rate is r_t and the level of net foreign assets owned by Emiratis in US Dollars is NFA_t). It is assumed that non-nationals do not save and either consume their income, or sent it abroad to their home country. The income tax levied on Emiratis is therefore (income tax rate is ty and the income of Emirati households is Y_t^{em}):

$$TY_t = ty \cdot (Y_t^{em} - SAV_t^{HH} + r_t \cdot NFA_t \cdot er_t) \tag{13}$$

It is assumed that all income tax is paid by UAE nationals. Furthermore, the net foreign assets of non-nationals is zero as we assume that non-nationals do not own any of the foreign assets or liabilities of the UAE. The tax rate for each of the taxes is considered exogenous and constant. Government behavior is assumed given, so the observed behavior in the base year will prevail for all coming years.

2.5 Description of the Rest-of-World

The level of foreign transfers is assumed given. Furthermore, world prices for imports and exports are dictated on the world market outside the influence of the country. The budget constraint for the Rest-of-World is in terms of the foreign currency (US Dollars):

$$\sum_{i=1}^{n} PWM_{it} \cdot M_{it} = \sum_{i=1}^{n} PWE_{it} \cdot E_{it} + \sum_{nat} FTRS_t^{nat} + r_t \cdot NFA_t + SAV_t^{ROW} \tag{14}$$

The Rest-of-World uses its receipts from exporting to the U.A.E. (for the U.A.E. these are the imports) to finance for their imports (exports of the U.A.E.), their foreign transfers to the U.A.E., their interest payments on their debt to the U.A.E., and the remaining part is used to save (savings by the rest-of-world are denoted by SAV_t^{ROW}). Whatever the Rest-of-World is saving is subtracted from the foreign assets owned by the Emiratis:

$$NFA_{t+1} = NFA_t - SAV_t^{ROW} + d_{adj} \cdot NFA_t \tag{15}$$

All items in this equation are in terms of US Dollars. In this equation we have a term similar to the deprecation term in the physical capital accumulation equation. This term with the parameter d_{adj} is added to the equation purely based on technical grounds. With this term we can have a certain value for foreign saving and at the same time have a constant level of net foreign assets. This property of the model is very convenient as we require the model to be in a steady state at the initial base period. In a steady state the level of net foreign assets is constant over time and with a non-zero value for foreign saving this can be achieved by adding this extra term to this equation.

2.6 Investment Good Production

Production of the investment good (I_t^K) is governed by a Cobb-Douglas production function:

$$I_t^K = A_k \cdot \prod_{i=1}^{n} INVD_{it}^{\Theta_i} \tag{16}$$

There is a company that is combining the investment goods ($INVD_{it}$) from the sectors into one investment good maximizes production subject to a budget constrain where the total amount spent on investment (price time quantity, or $PI_t \cdot I_t^K$) is used to pay for the inputs into production, the investment goods of each of the sectors ($INVD_{it}$), each of them priced at PC_{it}. From this maximization problem we can derive the optimal ratios of investment goods (take for instance for i the value 2, 3 up to n and take for j the value 1):

$$\frac{PC_{it} \cdot INVD_{it}}{PC_{jt} \cdot INVD_{jt}} = \frac{\Theta_i}{\Theta_j} \tag{17}$$

We also have the original budget constraint which states that the profit made by the firm in the investment sector is zero:

$$PI_t \cdot I_t^K = \sum_{i=1}^{n} PC_{it} \cdot INVD_{it} \tag{18}$$

2.7 Optimization Problem for Emiratis

The decision made by Emiratis is to allocate part of their income to the consumption of the consumption goods from all the sectors and the remaining part is saved and invested. They invest in net foreign assets, the physical capital stock and they invest in the government deficit. As there is no government debt in the current model, the investment in government debt can also be seen as a lump sum taxation and the government always runs a balanced budget.

The Emiratis, or equivalently the Emirati households, own labour and financial wealth. Financial wealth comprises of the capital stock which they own. They also have financial assets in foreign countries and they have financial liabilities towards in these foreign countries. The net assets constitute the second part of financial wealth.

Total income of the households is derived from labour income (wage rate times labor demand, or $wl_t^{em} \cdot LD_t^{em}$), current income from capital stock; in addition to government transfers:

$$\begin{aligned} Y_t^{em} &= wl_t^{em} \cdot LD_t^{em} + wk_t \cdot K_t + GTRS_t \cdot PINDEX_t + \\ &\quad wsubs_t \cdot LD_t^{em} + SUBS \cdot PINDEX_t + r_t \cdot NFA_t \cdot er_t \end{aligned} \tag{19}$$

Emirati consumers allocate their income from labor and financial wealth over income tax, spending on the consumption goods of all the sectors, foreign debt service payments, foreign transfers and the remaining part is saved to increase their financial wealth:

$$Y_t^{em} = TY_t + \sum_{i=1}^{n} PC_{it} \cdot CD_{it}^{em} + FTRS_t^{em} \cdot er_t + SAV_t^{HH} \tag{20}$$

We assume that the utility function for the Emirati consumers is the weighted sum of the logarithm of the consumption good of each sector and depends negatively on the fraction of the Emirati workforce that is employment u_t:

$$U_{em}(CD_{1t}^{em}, CD_{2t}^{em}, ..., CD_{nt}^{em}, u_t) = \sum_{i=1}^{n} \alpha_i \cdot \log CD_{it}^{em} - \xi \cdot (u_t)^{1+\sigma}$$

Consumers (Expats and Emiratis) are assumed to live forever and they are assumed to have perfect foresight. All Emirati consumers are assumed equal (as are all Expat consumers) and this allows

us to work with one representative Emirati consumer and one Expat consumer. The (representative) Emirati consumer derives utility from consumption. It is assumed that the Emirati consumers give less weight to future levels of consumption and this is represented by the constant rate of time preference ρ.

Emiratis decide how much to invest in the physical capital stock and the stock of net foreign assets. The Emiratis make the investment decision taking into account the evolution over time of the capital stock:

$$K_{t+1} = K_t + I_t^K - \delta \cdot K_t \tag{21}$$

The accumulation of capital stock over time is determined by the existing stock of capital, the level of investment and the depreciation which is assumed proportional with the stock of capital (δ is the depreciation rate). Savings of Emirati households are used for investment in the physical capital stock, investment in the net foreign assets (I_t^{NFA}) and investment in the government debt (I_t^{GDebt}), each valued at their appropriate prices:

$$SAV_t^{HH} = PI_t \cdot I_t^K + I_t^{NFA} \cdot er_t + I_t^{GDebt} \tag{22}$$

What Emiratis are investing in net foreign assets is the negative of the savings of the ROW:

$$I_t^{NFA} = -SAV_t^{ROW} \tag{23}$$

And what Emiratis are investing in the government debt is equal to the negative of the savings of the government:

$$I_t^{GDebt} = -SAV_t^{Gov} \tag{24}$$

Equation 22 can now be expressed as the familiar equation where investment in the domestic physical capital stock equals Emirati household savings, government saving and ROW saving:

$$PI_t \cdot I_t^K = SAV_t^{HH} + SAV_t^{ROW} \cdot er_t + SAV_t^{Gov} \tag{25}$$

In the current model it is assumed that the government is running a balanced budget. The government finances a deficit by imposing a lump-sum tax (LST_t) on Emirati households:

$$I_t^{GDebt} = -SAV_t^{Gov} = LST_t \tag{26}$$

Emirati households finance the government deficit, irrespective of its level. For the UAE the level of government savings is negative, which means that Emirati household receive money from the government.

The maximization problem for the Emiratis now reads:

$$\max_{CD_t^{em}, I_t^K, I_t^{NFA}, u_t} \sum_{t=0}^{\infty} \frac{1}{(1+\rho)^t} \cdot \sum_{i=1}^{n} \alpha_i \cdot \log CD_{it}^{em} - \xi \cdot (u_t)^{1+\sigma}$$

$$\begin{aligned}
\text{s.t.} \quad K_{t+1} &= K_t \cdot (1-\delta) + I_t^K \\
NFA_{t+1} &= NFA_t \cdot (1 + d_{adj}) + I_t^{NFA} \\
Y_t^{em} &= wk_t \cdot K_t + (wl_t^{em} + wsubs_t) \cdot u_t \cdot LS_t^{em} + r_t \cdot NFA_t \cdot er_t \\
&\quad + GTRS_t \cdot PINDEX_t + SUBS \cdot PINDEX_t \\
&= LST_t + TY_t + PI_t \cdot I_t^K + \sum_{i=1}^{n} PC_{it} \cdot CD_{it}^{em} \\
&\quad + FTRS_t^{em} \cdot er_t + I_t^{NFA} \cdot er_t
\end{aligned}$$

The initial level of net foreign assets is estimated based on the budget constraint of the ROW (Equation 14) and the equation governing the net foreign assets of Emiratis (Equation 15). Plugging in the former into the latter, leads to a difference equation in the level of net foreign assets (for this exercise we have $d_{adj} = 0$). As the UAE was founded in 1971 and assuming that in that year the net foreign assets are zero (at least very low to the levels the UEA earned in later years), it is possible to solve the difference equation based on historical data on imports and exports and foreign transfers. As not all the foreign transfers are known in early years, zero is assumed for them. The world interest rate used in this exercise is the United States FED fund rate as the world interest rate. This leads to a level of net foreign assets in 2008 of $1,637$ trillion AED. The world interest rate is an average of the level that it was in the past 15 years. Due to the global financial crisis in 2009, this interest rate is rather low currently and that would not do justice to the high level in the past and the high values that can be expected in the future.

To solve this intertemporal maximization problem we set up the Hamiltonian, derive the first-order conditions and arrive at a difference equation for consumption in the i^{th} sector:

$$\frac{CD_{it}^{em}}{CD_{i;t-1}^{em}} = \frac{1 + r_t + d_{adj}}{1 + \rho} \cdot \frac{PC_{i;t-1}}{PC_{it}} \cdot \frac{er_t}{er_{t-1}} \tag{27}$$

Additionally, we have the optimal price ratio's given by (take for i the value 2, 3, up to n; take for j the value 1):

$$\frac{PC_{it} \cdot CD_{it}^{em}}{PC_{jt} \cdot CD_{jt}^{em}} = \frac{\alpha_i}{\alpha_j} \tag{28}$$

Equilibrium on the labour market dictates that labour demand is equal to the labour effectively supplied. The latter is a fraction u_t of total Emirati labour supply, given by LS_{em}:

$$LD_t^{em} = u_t \cdot LS_{em} \tag{29}$$

For expats we have $LD_t^{nn} = LS_t^{nn}$ as there is no unemployment among them. Labour supply is exogenous and the choice of u_t is governed by the above given utility maximization problem. Based on the first-order conditions of the maximization problem, we arrive at the following optimal value for the Emiratis u_t:

$$u_t = (\frac{\alpha_i}{\xi \cdot (1+\sigma)} \cdot \frac{(wl_t^{em} + wsubs_t) \cdot LS^{em}}{PC_{it} \cdot CD_{it}^{em}})^{\frac{1}{\sigma}} \tag{30}$$

Based on the first order condition it is possible to derive the following no-arbitrage condition:

$$\frac{(1 + r_t + d_{adj}) \cdot PI_{t-1}}{er_{t-1}} = \frac{wk_t + (1-\delta) \cdot PI_t}{e_t} \tag{31}$$

In words, this equation states that investment is subject to the no-arbitrage condition that the return to capital should be the same as the return to a perfectly substitute asset. If we borrow at time period $t-1$ from the ROW the amount (in foreign currency) to buy one unit of capital at the price PI_{t-1}/er_{t-1} we have to pay at time period t the borrowed amount and the interest, or $(1 + r_t + d_{adj}) \cdot PI_{t-1}/er_{t-1}$, in terms of foreign currency. This will be equal to the total receipts which consist of the return of capital and the receipts from selling the unit of capital. The latter is the price of a unit of capital in foreign currency minus the depreciation of the unit of capital, or $(1-\delta) \cdot PI_t/er_t$. The no-arbitrage condition also takes into account that investments in net foreign assets provide a manna-from-heaven return due to the coefficient d_{adj} which is in Equation 15 because of technical reasons.

2.8 Consumption Decision of Expats

The income of expats households is derived from labour income (wage rate times labor demand, or $wl_t^{nn} \cdot LD_t^{nn}$). Part of their income is transferred back to their home country ($FTRS_t^{nn}$ which

is exogenously given) and the remaining part is consumed. This means that expats do not save. For simplicity, it is assumed that expats have the same preferences regarding consumption goods as Emiratis. For non-nationals, the choice to work or not to work is not relevant to them because, if they are unemployed, they will have to return to their home country. Their budget constraint is:

$$Y_t^{nn} \quad = \quad wl_t^{nn} \cdot LD_t^{nn} = FTRS_t^{nn} \cdot er_t + \sum_{i=1}^{n} PC_{it} \cdot CD_{it}^{nn} \tag{32}$$

They maximize utility subject to the budget constraint and a similar condition like Equation 28 is found as for expats.

2.9 Goods Market Equilibrium

For goods market equilibrium we must have that supply C_{it}, or total absorption, in each sector is equal to total demand. Total demand consists of consumption of consumers, investment good demand, intermediate demand ($INTD_{it}$), and finally, consumption by the government:

$$C_{it} = \sum_{nat} CD_{it}^{nat} + INVD_{it} + INTD_{it} + G_{it} \tag{33}$$

2.10 Factors of Production

The total capital stock is equal to the stock of capital employed in each of the sectors (K_{it}):

$$K_t = \sum_{i=1}^{n} K_{it} \tag{34}$$

It is assumed that non-nationals do not own any of the capital stock. Labor demand for nationality nat is equal to the sum of all labor of nationality nat demanded in the sectors (LD_{it}^{nat}):

$$LD_t^{nat} = \sum_{i=1}^{n} LD_{it}^{nat} \tag{35}$$

2.11 Value Added

We have two types of labor, Emirati laborers (L_t^{em}) and expats laborers (L_t^{nn}). They are combined into aggregate labor (AL_t) and this is combined with capital to create value-added. The two types

of labor are combined using a CES production technology to produce aggregate labor ($\rho_{AL} > -1$, $\alpha_{AL} > 0$ and $0 < \delta_{AL} < 1$):

$$AL_{it} = \alpha_{AL_i} \cdot [\delta_{AL_i} \cdot (LD_{it}^{nn})^{-\rho_{AL_i}} + (1 - \delta_{AL_i}) \cdot (LD_{it}^{em})^{-\rho_{AL_i}}]^{\frac{-1}{\rho_{AL_i}}} \tag{36}$$

The producers maximize temporal profits and this leads to the following optimal ratio of the two types of labor in each of the sectors:

$$\frac{LD_{it}^{nn}}{LD_{it}^{em}} = [\frac{\delta_{AL_i}}{1 - \delta_{AL_i}} \cdot \frac{wl_t^{em}}{wl_t^{nn}}]^{\frac{1}{1+\rho_{AL_i}}} \tag{37}$$

Given the first-order conditions we can deduce that the profits in each sector turn out zero (price of value-added is denoted by PAL_{it}):

$$PAL_{it} \cdot AL_{it} = wl_t^{em} \cdot LD_{it}^{em} + wl_{it}^{nn} \cdot LD_{it}^{nn} \tag{38}$$

The ρ_{AL} is a measure of how well Emirati laborers are substitutable for expat laborers. As mentioned before, Emirati laborers have certain disadvantages, but they also have advantages. Emiratis may have better access to bank loans, business contacts and the like. The value for ρ_{AL} is therefore taken as other elasticities regarding substitutability of factors of production.

Aggregate labor and capital are combined using a CES production technology to produce value added ($\rho_{VA} > -1$, $\alpha_{VA} > 0$ and $0 < \delta_{VA} < 1$):

$$X_{it} = VA(AL_{it}, K_{it}) = \alpha_{VA_i} \cdot [\delta_{VA_i} \cdot (AL_{it})^{-\rho_{VA_i}} + (1 - \delta_{VA_i}) \cdot K_{it}^{-\rho_{VA_i}}]^{\frac{-1}{\rho_{VA_i}}} \tag{39}$$

As before, the producers maximize temporal profits and this leads to the following optimal ratio of aggregate labor and capital employed in each of the sectors:

$$\frac{AL_{it}}{K_{it}} = [\frac{\delta_{VA_i}}{1 - \delta_{VA_i}} \cdot \frac{wk_t}{PAL_{it}}]^{\frac{1}{1+\rho_{VA_i}}} \tag{40}$$

Given the first-order conditions we can deduce, as we have previously, that the profits in each sector turn out zero (price of value-added is denoted by PVA_{it}):

$$PVA_{it} \cdot X_{it} = PAL_t \cdot AL_{it} + wk_{it} \cdot K_{it} \tag{41}$$

Besides capital and labor, there is a third factor of production, the intermediate input supplied by all sectors (proportional to IO_{ij} times the level of output of sector i). The intermediate input is combined with the value added output into the output of goods from the i^{th}-sector. For this a Leontief technology is used. Suppose we look at the output of the first sector ($i = 1$):

$$X_{1t} = f(VA(L_{1t}, K_{1t}), IO_{11} \cdot X_{1t}, IO_{21} \cdot X_{1t}, ..., IO_{n1} \cdot X_{1t})$$

The producers have to pay a tax proportional to their output at a rate of it_i. As the production takes place using a Leontief technology, all inputs are used in fixed proportions and we get for the net price of output:

$$(1 - it_i) \cdot PX_{it} = PVA_{it} + \sum_{j=1}^{n} P_{jt} \cdot IO_{ji}$$

Or, rearranging:

$$PVA_{it} = (1 - it_i) \cdot PX_{it} - \sum_{i=j}^{n} P_{jt} \cdot IO_{ji} \tag{42}$$

Total intermediate demand for goods from the i^{th}-sector is given by:

$$INTD_{it} = \sum_{j=1}^{n} IO_{ij} \cdot X_{jt} \tag{43}$$

2.12 Terminal Conditions

The discrete time model will be solved using the numerical optimization software tool GAMS, see Brooke, Kendrick, Meeraus and Raman (1998). In theory, we would have to take an infinite number of time periods as only at $t = \infty$ will the model have reached the steady state. This is of course not possible because it would require an infinite number of calculations. There is an adjustment needed to make sure that the numerical outcome of the model with a finite horizon is equivalent to the outcome with an infinite horizon. This is termed steady state invariance; see Mercenier and Michel ((1994a) and (1994b)). For the current model this means that an additional term is added to the objective function, which is the utility function of consumers, representing the value of the objective function for all remaining time periods that are not considered. By assuming that from the last time period onward the economy is in a steady state we know that consumption in the utility function is constant. Then the additional term is simply the infinite sum of discounted utility levels. Following the argument by

Mercenier and Michel, we have to impose the following conditions to the model. Firstly, the capital stock in the steady state is constant, or depreciation is equal to investment (refer to Equation 21 and T is the final time period):

$$\delta \cdot K_T = I_T \tag{44}$$

Finally, the stock of external debt has to be constant which means that foreign borrowing is equal to the adjustment of foreign debt (refer to Equation 15):

$$d_{adj} \cdot NFA_T = SAV_T^{ROW} \tag{45}$$

2.13 Walras' Law

Because of Walras' law we can omit any of the equations describing one of the goods market equilibriums and we choose the Equation 35 for the Emirati laborers which describes labor market equilibrium and states that the total amount of Emirati labor is divided over the various sectors. This equilibrium condition can be left out as Walras' Law states that if all markets, except the labor market for Emiratis, are in equilibrium then the labor market for Emiratis is also in equilibrium. The remaining equations, 1 up to 45 and excluding 35, then fully describe our model.

2.14 Price Numéraire

As the model is homogeneous of degree one in prices we can make one price the Numéraire. We choose this price to be the exchange rate er and its value is set to its historical value.

3 Data and Model calibration

The model is calibrated using publicly available data for the year 2008 from official sources. Data from UAE Ministry of Economy and Planning (MOEP), National Bureau of Statistics and UAE Central Bank (CB) is combined to arrive at a social accounting matrix (SAM) as a database for calibrating the model. The MOEP distinguishes the 15 separate sectors in the UAE economy. These 15 sectors are aggregated in eight sectors for the model calculations. The eight sectors and their underlying sub-sectors from the MOEP are:

- A. Agriculture

- B. Crude oil/Natural gas combined with Quarrying
- C. Manufacturing combined with Electricity
- D. Construction combined with Real estate
- E. Trade combined with Transport
- F. Restaurants and hotels
- G. Financial corporation sector
- H. Government services sector combined with Social and personal services

We have dispersed the sectors Domestic services of households and Imputed bank services over all other sectors. The reason for this is that both sectors are small and from an economic point of view less interesting. The Domestic services of households sector has only labour and no capital. The Imputed bank services sector has a negative capital income and the latter issue would only complicate the calculations in the sequel. The CES and CET elasticity's have been assigned values that are in accordance with the literature on these types of elasticities (see Erbil (2004) and De Melo and Tarr (1992)). We have chosen values closer to the lower bounds of the range reported in the literature as we expect the substitutability to be low in the UAE. With the model we replicate the UAE economy in the year 2008. The value for a number of tax rates have the same value as in a previous year as data on them is not (yet) available. This is for the import tariffs (tm_i), income tax (ty) and indirect tax on goods (tx_i). The level of government transfers ($GTRS_t$) have been taken as the same fraction of GDP at market prices as in a previous year. This is the base run of the model, which is the steady state solution of the model. The variables in the model are per capita values and most of them are in real terms. In the steady state the per capita (real) values are constant.

The MOEP provides most of the data required to fill the SAM. As a lot of the sectoral data is missing for the SAM for the UAE and have been estimated. The estimation was such that the ratio values of the missing sectoral data (with respect to the sum of all sectors, which is known) would lie as close as possible to the corresponding ratio for the Kuwait economy. The Kuwait economy is rather similar to the economy of the UAE and as there is a SAM available for Kuwait for the year 2000, this country was chosen. The pattern of consumption is assumed to be the same for Emiratis and Non-nationals as data on this is missing (see Vellinga (2006) for more details). The SAM for the UAE for 2008 can be found in Tables 8 through 10 in Appendix A. The values in the SAM are all nominal values, but we will be working with real per capita values. All values in the sequel are in millions UAE Dirham. All other missing data, like the level of net foreign assets of the UAE and some of the tax rates, is estimated by the author based on realistic assumptions to arrive at a consistent macroeconomic data set. Based on the data in the SAM that has been assembled it is possible to calibate the various parameters and exogenous variables in the model.

3.1 Stability

In general, we talk about stability if after introducing a perturbation to the steady state of the model, the time path of the variables converges to a new steady state. If we could apply any perturbation, how big it might be, we talk about global stability. If on the other hand we also look at small perturbations, we consider local stability. The first-order conditions for optimality together determine the local optimum of the model. All functional forms are chosen in such ways that that the necessary conditions for an optimum are also sufficient conditions (see Chiang (1997)) for a global optimum to exist. One can think of certain concavity conditions with respect to the shape of the production functions, and the utility function.

4 Policy Experiment

The policy experiment run with the model is one where we look more closely at the impact of reducing the subsidy to nationals and replacing it by a wage subsidy paid out to nationals that are employed. As Figure 1 below shows, the unemployment of UAE nationals goes down as the subsidy to nationals is reduced by 1.0% and the wage subsidy is such that nationals get 0.9% more wage.

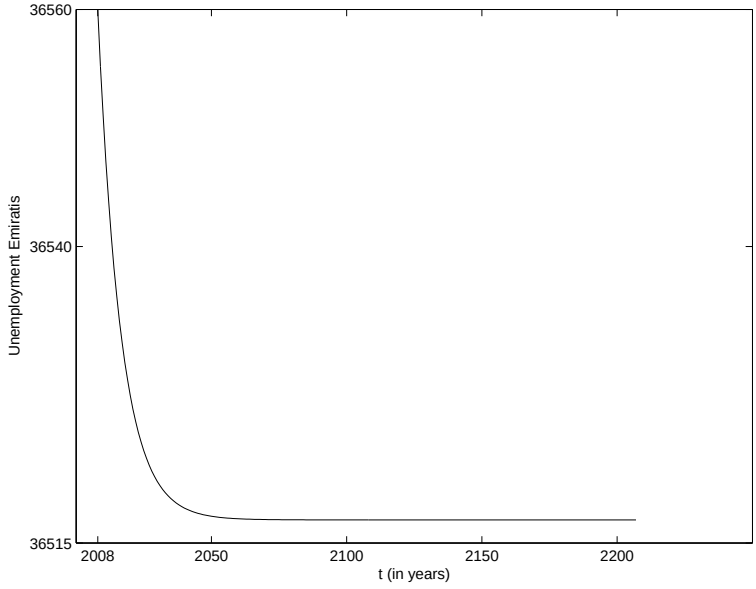

Figure 1: Level of unemployment of nationals over time (in number of unemployed Emiratis)

Unemployment in the base run in 2008 amounts to $38,186$ Emiratis when the total Emirati labor force

is estimated on 468, 215. This is from the labor force survey 2009. The result of shifting the subsidies to nationals that work leads to an immediate drop of unemployment to 36, 560 Emiratis, a reduction of 4.26%. Over time unemployment settles at a value which is 4.37% lower than its base run value. Employment of Emiratis by sector is shown in Table 1.

	2008	2013	2016	2023	2033	2050	2079	2127	2207
Agriculture	0.255	0.264	0.267	0.272	0.274	0.275	0.275	0.275	0.275
Crude oil and Natural gas and Quarrying	0.265	0.294	0.305	0.319	0.327	0.330	0.330	0.330	0.330
Manufacturing and Electricity	0.255	0.292	0.305	0.323	0.333	0.336	0.337	0.337	0.337
Construction and Real estate	0.416	0.371	0.354	0.332	0.320	0.315	0.314	0.314	0.314
Trade and Transport	0.046	0.045	0.044	0.044	0.043	0.043	0.043	0.043	0.043
Restaurants and hotels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Financial corporations sector	0.394	0.404	0.408	0.413	0.416	0.417	0.417	0.417	0.417
Government, Social and Personal services	0.406	0.410	0.411	0.413	0.415	0.415	0.415	0.415	0.415

Table 1: Employment of Emiratis by sector over time after the introduction of a wage subsidy (percentage change with respect to the base run)

By receiving the subsidy, Emiratis are more eager to take up jobs and their level of employment increases in all sectors where they are active.

As there is now more labor relative to capital, the reward for employing capital increases:

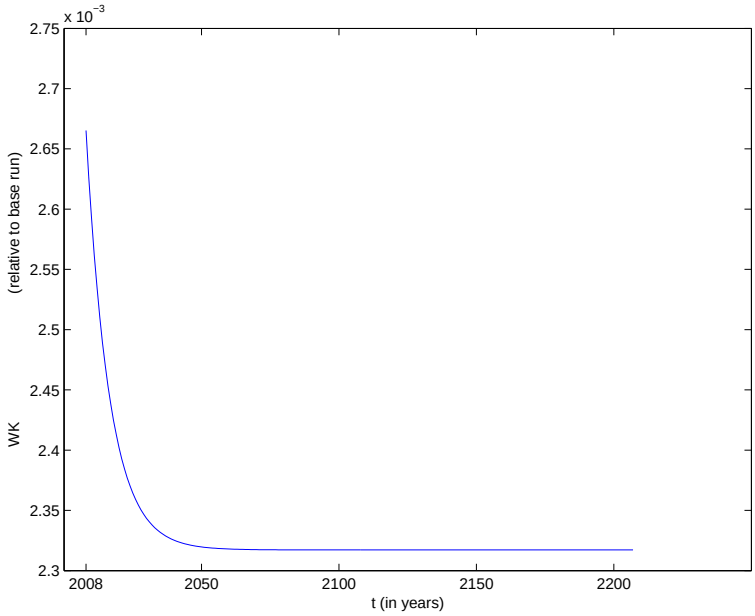

Figure 2: Reward for capital over time (relative to base run)

As a result Emiratis will invest more in capital and the capital stock increases (Figure 3).

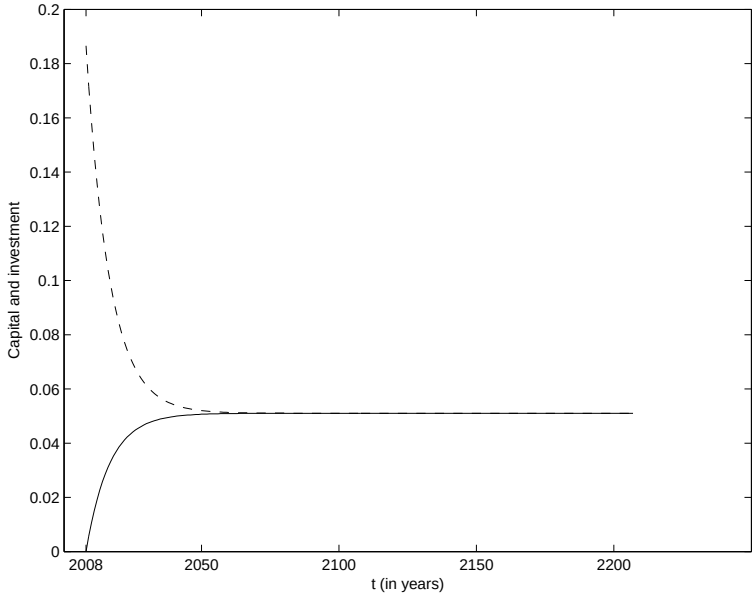

Figure 3: Level of investment (dashed) and capital stock over time (relative to base run)

See Table 2 for how capital is reshuffled over the sectors.

	2008	2013	2016	2023	2033	2050	2079	2127	2207
Agriculture	-0.007	0.005	0.009	0.015	0.018	0.020	0.020	0.020	0.020
Crude oil and Natural gas and Quarrying	0.003	0.035	0.047	0.062	0.071	0.074	0.075	0.075	0.075
Manufacturing and Electricity	-0.007	0.032	0.047	0.066	0.076	0.081	0.081	0.081	0.081
Construction and Real estate	0.154	0.112	0.096	0.075	0.064	0.059	0.059	0.059	0.059
Trade and Transport	-0.215	-0.214	-0.213	-0.213	-0.212	-0.212	-0.212	-0.212	-0.212
Restaurants and hotels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Financial corporations sector	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Government, Social and Personal services	0.143	0.150	0.153	0.156	0.158	0.159	0.159	0.159	0.159

Table 2: Physical capital stock by sector over time after the introduction of a wage subsidy (percentage change with respect to the base run)

To compensate for the increase in labour supply, the Emiratis consume of each consumption good:

	2008	2013	2016	2023	2033	2050	2079	2127	2207
Agriculture	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
Crude oil and Natural gas and Quarrying	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Manufacturing and Electricity	0.101	0.101	0.101	0.102	0.102	0.102	0.102	0.102	0.102
Construction and Real estate	0.097	0.097	0.097	0.097	0.097	0.097	0.097	0.097	0.097
Trade and Transport	0.093	0.093	0.093	0.093	0.093	0.093	0.093	0.093	0.093
Restaurants and hotels	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.091
Financial corporations sector	0.125	0.125	0.124	0.124	0.124	0.124	0.124	0.124	0.124
Government, Social and Personal services	0.275	0.273	0.272	0.271	0.270	0.270	0.270	0.270	0.270

Table 3: Level of consumption for Emiratis over time (percentage change with respect to the base run)

For non-nationals, the level of consumption of the various sectors is going up too:

	2008	2013	2016	2023	2033	2050	2079	2127	2207
Agriculture	0.038	0.038	0.038	0.039	0.039	0.039	0.039	0.039	0.039
Crude oil and Natural gas and Quarrying	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Manufacturing and Electricity	0.040	0.040	0.040	0.041	0.041	0.041	0.041	0.041	0.041
Construction and Real estate	0.035	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Trade and Transport	0.031	0.031	0.032	0.032	0.032	0.032	0.032	0.032	0.032
Restaurants and hotels	0.029	0.029	0.030	0.030	0.030	0.030	0.030	0.030	0.030
Financial corporations sector	0.064	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063
Government, Social and Personal services	0.214	0.212	0.211	0.210	0.209	0.209	0.209	0.209	0.209

Table 4: Level of consumption for Non-nationals over time (percentage change with respect to the base run)

Regarding the imports and the exports, their level relative to their base run values is shown below in Table 5 and Table 6 respectively.

	2008	2013	2016	2023	2033	2050	2079	2127	2207
Agriculture	0.053	0.065	0.070	0.076	0.080	0.081	0.081	0.081	0.081
Crude oil and Natural gas and Quarrying	0.010	0.041	0.053	0.068	0.077	0.080	0.081	0.081	0.081
Manufacturing and Electricity	0.087	0.073	0.068	0.062	0.058	0.056	0.056	0.056	0.056
Construction and Real estate	0.154	0.112	0.096	0.075	0.064	0.060	0.059	0.059	0.059
Trade and Transport	0.061	0.066	0.068	0.071	0.072	0.073	0.073	0.073	0.073
Restaurants and hotels	0.042	0.058	0.063	0.071	0.075	0.077	0.077	0.077	0.077
Financial corporations sector	0.083	0.098	0.104	0.111	0.115	0.116	0.117	0.117	0.117
Government, Social and Personal services	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 5: Level of imports over time (percentage change with respect to the base run)

	2008	2013	2016	2023	2033	2050	2079	2127	2207
Agriculture	-0.023	-0.012	-0.007	-0.002	0.002	0.003	0.003	0.003	0.003
Crude oil and Natural gas and Quarrying	0.002	0.034	0.046	0.061	0.070	0.073	0.074	0.074	0.074
Manufacturing and Electricity	-0.008	0.031	0.045	0.065	0.075	0.079	0.080	0.080	0.080
Construction and Real estate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Trade and Transport	-0.223	-0.222	-0.221	-0.221	-0.221	-0.220	-0.220	-0.220	-0.220
Restaurants and hotels	-0.122	-0.108	-0.103	-0.096	-0.093	-0.091	-0.091	-0.091	-0.091
Financial corporations sector	0.164	0.176	0.181	0.187	0.190	0.192	0.192	0.192	0.192
Government, Social and Personal services	0.276	0.281	0.283	0.285	0.286	0.287	0.287	0.287	0.287

Table 6: Level of exports over time (percentage change with respect to the base run)

As Figure 4 below shows, the UAE net foreign assets position goes down. Imports rise faster than exports and some sectors export even less. This leads to a depletion of net foreign assets of the Emiratis:

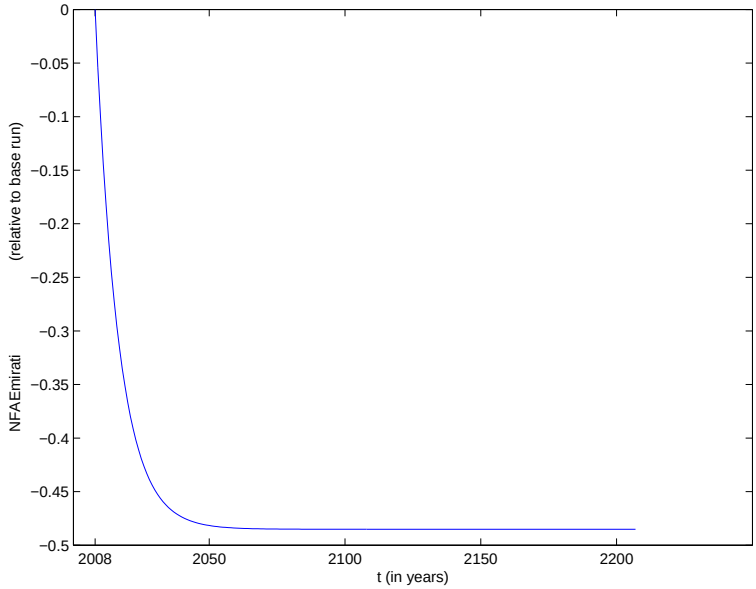

Figure 4: Level of net foreign assets over time (relative to base run)

To see how unemployment responds to various wage subsidy levels, the following table shows the short-term (ST) and the long-term (LT) effect on unemployment of a wage subsidy and corresponding fall in overall subsidies:

Overall subsidy decrease	Wage subsidy increase	Short-term effect on unemployment	Long-term effect on unemployment
1.0	0.9	4.26	4.37
2.0	1.8	8.53	8.76
3.0	2.7	12.83	13.16
4.0	3.6	17.14	17.58
5.0	4.5	21.46	22.01

Table 7: Short and long-term effect on unemployment for various wage subsidies.

The more non-wage subsidies are replaced by wage subsidies, the lower unemployment will be of Emiratis.

5 Concluding Remarks

This paper is the first attempt to develop a multi-sector dynamic CGE model for the UAE economy. A consistent database, in the form of a social accounting matrix, has been constructed for the first time for UAE. The model is calibrated based on the data from the SAM and then it is used to simulate a policy experiment that is relevant for the present and the future of the UAE economy. We look at the subsidies to nationals and replace the subsidies nationals receive irrespective of whether they are employed or not, with a subsidy for employed nationals. The former subsidy is decreased by 1.0% and the latter subsidy is set at 0.9%. Employed nationals get a 0.9% increase in salary and this is paid by the reduction of the first subsidy. The outcome is such that the unemployment of nationals decreases initially by 4.26% and in the long-term unemployment drops by 4.37%.

The current model can be extended in various directions to study several issues that are pertinent to the UAE economy. One possible extension is to include imported intermediate and capital goods. A second possible extension is to disaggregate labour into different skill levels. Also, the exploitation of the finite exhaustible resource oil could be modeled explicitly and then the government behavior, which aims at making the UAE economy less dependent on oil, could be studied.

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A SAM for UAE

The SAM for the UAE for the year 2008 is presented in three parts. The values in the SAM are nominal values and all values are in millions UAE Dirham.

		A	B	C	D	E	F	G	H	Sector Total
Production	A. Agriculture	0	0	11,267	0	0	0	0	0	11,267
	B. Crude oil and Natural gas and Quarrying	0	0	177,479	0	0	0	0	0	177,479
	C. Manufacturing and Electricity	3,690	3,023	66,835	31,932	10,047	4,453	670	344	120,995
	D. Construction and Real estate	0	0	0	0	0	0	0	0	0
	E. Trade and Transport	0	0	15,023	0	0	0	0	0	15,023
	F. Restaurants and hotels	0	0	5,409	0	0	0	0	0	5,409
	G. Financial corporations sector	0	0	6,155	0	0	0	13,408	0	19,563
	H. Government and Social and Personal services	0	0	9,022	0	0	0	0	0	9,022
	Sector Total	3,690	3,023	291,190	31,932	10,047	4,453	14,078	344	358,758
Income creation	Labour income Emiratis	44	906	677	815	1,390	0	1,626	21,564	27,022
	Labour income Non-nationals	2,870	5,465	18,005	33,948	43,288	4,734	10,438	43,046	161,794
	Capital income	640	509,151	90,325	75,933	59,004	0	0	1,077	736,130
Income distribution distribution	Emirati Households									
	Non-national Households									
	Government subsidies	−442	0	−607	0	−303	0	0	−808	−2,160
	Government taxes	0	1	173	1,623	5,257	142	262	225	7,683
Institutions	Emirati Households									
	Non-national Households									
	Capital									
	Government									
	ROW current	34,109	26,298	559,793	60,099	95,381	12,550	18,671	0	806,901
	ROW capital									
Total		40,911	544,844	959,555	204,351	214,066	21,879	45,075	65,448	2,096,128

Table 8: SAM for the UAE (part I) with values in million Dirhams.

		Sector Total	Labour income Emiratis	Labour income Non-nationals	Capital income	Income households Emiratis	Income households Non-nationals	Income government subsidies	Income government taxes
Production	A. Agriculture	11,267							
	B. Crude oil and Natural gas and Quarrying	177,479							
	C. Manufacturing and Electricity	120,995							
	D. Construction and Real estate	0							
	E. Trade and Transport	15,023							
	F. Restaurants and hotels	5,409							
	G. Financial corporations sector	19,563							
	H. Government and Social and Personal services	9,022							
	Sector Total	358,758							
Income creation	Labour income Emiratis	27,022							
	Labour income Non-nationals	161,794							
	Capital income	736,130							
Income distribution	Emirati Households		38,692		624,019				
	Non-national Households			125,094					
	Government subsidies	−2,160				−24,194			
	Government taxes	7,683				2,603			
Institutions	Emirati Households					498,182			
	Non-national Households						125,094		
	Capital				112,111				
	Government							−26,355	14,079
	ROW current	806,901	−11,670	36,700					
	ROW capital								
Total		2,096,128	27,022	161,794	736,130	476,591	125,094	−26,355	14,079

Table 9: SAM for the UAE (part II) with values in million Dirhams.

		Emirati Households	Non-national Households	Capital	Government	ROW current	ROW capital	Grand Total
Production	A. Agriculture	16,563	6,904	0	314	5,513		40,612
	B. Crude oil and Natural gas and Quarrying	0	0	14,973	0	352,815		545,319
	C. Manufacturing and Electricity	155,177	64,686	154,173	66,342	398,967		960,089
	D. Construction and Real estate	39,519	16,474	145,068	3,771	0		204,833
	E. Trade and Transport	54,401	22,677	0	11,131	110,248		213,663
	F. Restaurants and hotels	5,153	2,148	0	1,082	8,309		22,125
	G. Financial corporations sector	5,293	2,206	0	1,220	16,597		45,009
	H. Government and Social and Personal services	22,607	9,424	0	2,314	21,299		64,479
	Sector Total	298,713	124,520	314,215	86,173	913,748		2,096,128
Income creation	Labour income Emiratis							27,022
	Labour income Non-nationals							161,794
	Capital income							736,130
Income distribution	Emirati Households				−186,121			476,591
	Non-national Households				0			125,094
	Government subsidies							−26,355
	Government taxes	1,376	573	1,447	397	0		14,079
Institutions	Emirati Households							498,182
	Non-national Households							125,094
	Capital	198,093	0		87,275			397,479
	Government							−12,275
	ROW current						81,817	913,748
	ROW capital			81,817				81,817
Total		498,182	125,094	397,479	−12,275	913,748	81,817	

Table 10: SAM for the UAE (part III) with values in million Dirhams.